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Indian Standard

TUNGSTEN HALOGEN LAMPS (NON-VEHICLE) — SPECIFICATION

UDC 621·326·79

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

November 1990

Price Group 6

Electric Lamps and Their Auxiliaries Sectional Committee, ETD 23

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards on 19 February 1990, after the draft finalized by the Electric Lamps and Their Auxiliaries Sectional Committee had been approved by the Electrotechnical Division Council.

At present the standard covers tungsten halogen lamps for floodlight and film studio use only. It is intended to cover lamps for other applications as and when the need arises.

In the preparation of this standard, assistance has been taken from IEC Publication 357 (1982) 'Tungsten halogen lamps', published by the International Electrotechnical Commission.

Indian Standard

TUNGSTEN HALOGEN LAMPS (NON-VEHICLE) — SPECIFICATION

1 SCOPE

1.1 This standard covers the requirements and methods of test for tungsten halogen lamps. The lamps covered by this standard are designed specifically for use in area lighting, sports lighting and film studio lamps used for stage lighting, TV studio, photographic studio, etc.

1.1.1 Lamps for automobile, aircraft and similar applications are not covered by this standard.

2 TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Batch

This term denotes all the lamps of one type put forward at one time for test for acceptance.

2.2 Tungsten Halogen Lamp

A gas filled lamp containing halogens or halogen compounds, the filament being of tungsten.

2.3 Inspection Test Quantity (ITQ)

The number of lamps to be tested with the object of determining the acceptability of the batch as to marking mechanical and physical requirements.

2.4 Rating Test Quantity (RTQ)

The number of lamps to be tested with the object of determining the acceptability of the batch as to initial readings.

2.5 Life Test Quantity (LTQ)

The number of lamps to be tested with the object of determining the acceptability of the batch as to life.

2.6 Lumen

The lumen is the unit of luminous flux. It is equal to the flux emitted in a solid angle of one steradian by a uniform point source of one candela.

2.7 Initial Readings

The initial readings are the photometric and electrical measurements made at the end of the ageing period.

2.8 Life

The life of a lamp is, the number of hours it operates to 'burn out' or to any other criterion of life performance laid down in this standard.

2.9 Rated Voltage

The voltage marked on the lamp.

2.10 Rated Wattage

The wattage marked on the lamp.

2.11 Rated Lumen

The lumens declared.

3 GUIDANCE FOR THE APPLICATION OF TUNGSTEN HALOGEN LAMPS

3.1 Fluctuation in the mains supply voltage may adversely affect the life performance of tungsten halogen lamps. As far as possible, therefore, lamps of the tungsten halogen type should at all times be operated at voltages close to the rated voltage marked on the lamp. In any event the applied voltage should not exceed 110 percent of the rated voltage and preferably should not be above 105 percent of the rated voltage.

If lamps are marked with a voltage range, the rated voltage shall be taken as the mean of the voltages marked.

For projection lamps operated from a transformer, the effect of increases in primary voltage on the secondary (output) voltage can be minimized by suitable design of the transformer regulation.

4 CAUTIONARY NOTICE FOR PHOTOGRAPHIC AND FLOODLIGHTS LAMPS

4.1 It is recommended that cautionary notices should be supplied with tungsten halogen photographic and floodlight lamps. These notices should cover at least the following minimum requirements and should be based on the wording as follows:

CAUTION — To ensure maximum safety, the following precautions should be observed:

a) Disconnect the plug from the power supply before removing or replacing the lamp, or the equipment fuse.

b) If the lamp has been provided with a protective cover, do not remove the cover until after the lamp has been inserted in the equipment.

If the quartz bulb is touched by the bare hands, it should be cleaned with a lint-free cloth moistened with methylated spirit.

c) Always operate the lamp in series with a suitable fuse which meets the standard requirements for quick-acting, high breaking capacity fuses of rated current. (The rated current for this fuse should be in accordance with the values specified in Table 1 or Table 2).

d) Avoid improper operation of the lamp, such as:

   i) Burning positions other than those recommended by the manufacturer;

   ii) Operation at over-voltage, or for a longer period than specified, or

   iii) In conjunction with improper fuses or equipment not specifically designed for that type and rating of lamp.

   Non-observance of these precautions may lead to damage to the lamp and equipment and, in extreme cases, to bursting of the lamp.

e) Any other requirement specified on an individual standard sheet.

   Note to Equipment Manufacturers

   Since specific conditions may have to be observed in order to ensure correct and safe operation of the lamp, equipment manufacturers should request the latest detailed information from the lamp manufacturers.

5 USE OF EXTERNAL FUSES

5.1 Photographic Lamps

The current ratings for the fuses that are recommended in the cautionary notices [*see* (c) of **4** of the cautionary notices] should be in accordance with Table 1.

Table 1 Fuse Values for Photographic Lamps

(*Clauses* 4.1 *and* 5.1)

Lamp		Fuse Rated Current (A)
Voltage (V)	Wattage (W)	
(1)	(2)	(3)
200..... 250	1 000	6·3

Recommendations for fuses for lamps of other wattage and voltage ratings are under consideration.

The fuses recommended for these lamps should be of a quick-acting, high-breaking capacity type.

5.2 Floodlight Lamps

The current ratings for the fuses that are recommended in the cautionary notices [*see* (c) of **4.1**] shall be in accordance with Table 2.

Table 2 Fuse Values for Floodlight Lamps

(*Clauses* 4.1 *and* 5.2)

Lamp		Fuse Rated Current (A)	
Voltage (V)	Wattage (W)	(a)	(b)
200..... 250	300	2·0*	—
200......250	500	4·0	—
200..... 250	750	6·3	6·0
200......250	1 000	6·3	6·0
200......250	1 500	—	10·0

*The value under consideration

a) "Quick-acting" miniature fuses 250 V with high breaking capacity

b) "Quick-acting" D-fuses, 500 V.

6 MAXIMUM PINCH TEMPERATURES FOR TUNGSTEN HALOGEN LAMPS

6.1 Maximum permissible pinch temperatures of quartz lamps measured according to the method prescribed in Annex A are specified for each lamp on the relevant data sheet.

Compliance with the maximum pinch temperature requirement will avoid premature lamp failure. Moreover, it will reduce the risk and violence of a possible shattering caused by increased internal pressure due to excessive temperature.

6.2 The maximum permissible pinch temperature is related to the rated lamp life and to its operating conditions. The following relation between the above parameters should be used as a guideline (*see* Table 3).

NOTE — This test shall be carried out as a type test on one lamp only and the sample shall comply with the requirements laid down in this clause. In case of failure, three more samples shall be tested and there shall be no failure to establish compliance with this clause.

Table 3 Maximum Pinch Temperatures

Lamp Rated Life (h)	Operating Conditions	Maximum Pinch Temperature (°C)
(1)	(2)	(3)
≥ 300	Normal	350
≥ 200	Normal photographic use	
Any	Unprotected operation in humid environment	
Between 15 and 300 (both excluded)	Normal	400
≤ 15	Normal	450

NOTE — Higher maximum pinch temperatures may be specified in the relevant lamp standard sheets for certain lamp types of special design, provided the same level of safety is ensured.

7 REQUIREMENTS FOR MECHANICAL AND PHYSICAL CHARACTERISTICS

7.0 General

Lamps shall be so designed and constructed that in all normal and accepted use their performance is reliable and without danger to the user or surroundings. In general, compliance shall be checked by carrying out all the tests specified.

7.1 Lamp Dimensions

The lamps shall comply with the requirements specified in Tables 4 and 5 for dimensions, interchangeability and safety.

7.2 There shall be no visible cracks in the lamp cap. In case cracks are visible the lamp shall be rejected.

7.3 The dimensions of R7s-15 lamp caps shall be in accordance with the data sheet given in Annex B.

Table 4 Lamp Requirements and Characteristics

(*Clauses* 7.1 *and* 11.3)

Types of Lamps	Wattage in Watts	Voltage in Volts	Lamp Cap	Contact to Base End Length *B, Max* (mm)	Contact to *BA* Contact Length *Z* (mm)	Maximum Diameter (mm)	*P Max* (mm) (Note 1)	Rated Luminous Flux (Lumens)	Rated Life (Hours)	Lumen Maintenance
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Floodlight	1 500	240-250	R7s-15	254·1	250·7±1·6	12	10·2	32 000	2 000	95 percent at 75 percent of the rated life
Floodlight	1 000	240-250	R7s-15	189·1	185·7+1·6	12	10·2	20 000	2 000	
Floodlight	750	240-250	R7s-15	189·1	185·7±1·6	12	10·2	14 000	2 000	
Floodlight	500	240-250	R7s-15	117·6	114·2±1·6	12	10·2	8 700	2 000	
Floodlight	300	240-250	R7s-15	117·6	114·2±1·6	12	10·2	5 000	1 500	
Film Studio*	1 000	220-230	R7s-15	189·1	185·7±1·6	12	10·2	25 000	200	
Film Studio†	1 000	220-230	R7s-15	125·0	121·7±1·6	12	10·2	32 000	15	

*Colour temperature of film studio lamps = 3200°K ± 100°K

†Colour temperature of film studio lamps = 3400°K ± 100°K

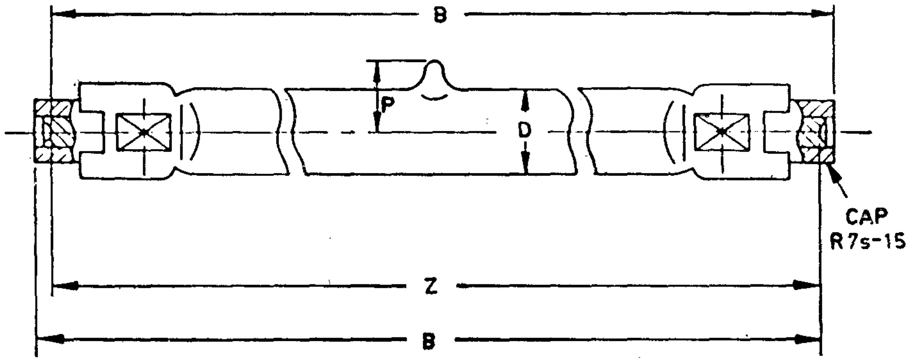
NOTES

1 *Initial Lumen Tolerance* — The initial lumens of individual lamps shall not be less than 93 percent of the rated lumens.

2 If a lamp failed in lumen maintenance it would be deemed to have failed at 70 percent of the rated life.

Table 5 Lamp Dimensions

(*Clause* 7.1)



All dimensions in millimetres.

Rated Wattage (W)	Z *Nom* Tolerance ±1·6	B *Max*	P *Max* (*see* Note)	D *Max*
300 500	114·2	117·6	10·2	12·0
750 1000	185·7	189·1		
1500	250·7	254·1		

Conditions of Use

Operating position—These lamps are designed to operate within 4° of the horizontal; they may, however, be operated up to 15° from the horizontal, but such operating positions could have an adverse effect on their performance.

Pinch temperature—The permissible maximum pinch temperature is 350°C (*see* Annex A)

NOTE — The pip of the exhaust tube shall lie in the plane of the pinches.

8 SAMPLING

8.1 Principles of Sampling

The lamps for testing shall be selected in accordance with a mutually agreed method such as to ensure proper representation (*see* Annex C).

8.1.1 In order to cover the risk of accidental breakage, a certain number of lamps, in addition to the test quantity, shall be selected. These lamps shall only be substituted for lamps of the test quantities if necessary to make up the required quantities for the tests. It is not necessary to replace an accidentally broken lamp if the result of the test (approval or rejection) is not affected by its replacement, provided the required quantity of lamps for the following test is available. If replaced, such a broken lamp shall be neglected in calculating the test result.

8.2 Inspection Test Quantity (ITQ)

The inspection test quantity shall be 25.

8.3 Rating Test Quantity (RTQ)

From the lamps which have passed the inspection test, the rating test quantity shall be 20 selected at random.

8.4 Life Test Quantity (LTQ)

From the lamps which have passed the rating test, life test quantity of 5 lamps shall be selected at random.

9 MARKING

9.1 The lamps shall be distinctly and indelibly marked at any suitable position with the following information:

a) Indication of the source of manufacture;

b) The rated volts (marked 'V' or volts);

c) The rated watts (marked 'W' or watts);

d) Country of manufacture; and

e) The rated lumen output.

NOTE — The manufacturer may declare a higher value of rated lumen output than the minimum specified in the standard. Due to limitation of space on lamps this information may, however, be marked on the carton only.

10 CONDITIONS OF TEST AND REQUIREMENTS

10.1 Conditions of Testing

10.1.1 *Position of Burning*

For the purpose of test for initial readings, the lamps shall burn in a horizontal position.

10.1.2 *Ageing*

Before the initial readings are taken, the lamps shall be aged for 1 hour.

10.1.3 *Limits on Maximum Watts*

The lamps shall have a maximum wattage at rated voltage as follows:

Limits on maximum watts = nominal wattage + 8 percent

10.1.4 *Photometry*

Measurement shall be carried out at the rated voltage with a suitable integrating photometer. Guidance can be taken from IS 2407 : 1963.

10.1.5 *Life Test Procedure*

10.1.5.1 *Test voltage*

The test voltage shall be the rated voltage. The lamp shall burn on an alternating current at a frequency of a nominal value between 40 Hz and 60 Hz.

10.1.5.2 *Voltage control*

The variation in the power supply under steady state conditions shall be within ±0·5 percent. The momentary fluctuation of the test voltage during the life test shall not exceed ±1 percent. The voltage shall be free from perceptible flicker.

10.1.5.3 *Switching 'on' and 'off'*

All lamps shall be switched off for 15 minutes after every 12 hours of burning. In case of lamps having 15 hours life, the lamps shall be switched off for 15minutes after every 5 hours of burning.

11 CONDITION OF COMPLIANCE

11.1 All the lamps chosen for ITQ shall be tested for mechanical, physical and marking requirements. A batch shall be considered to comply with the requirements of this clause if the number of lamps failing does not exceed:

a) For a normal batch having an ITQ of 25 lamps:
   i) 2 for any one of the tests; and
   ii) 5 for all the tests.

11.2 *Initial Ratings*

All the lamps chosen for the RTQ shall be tested at rated voltage for initial wattage, lumen. A batch shall be considered to comply with the requirements of the initial ratings, if:

a) for a normal batch having a RTQ of 20 lamps:
   i) number of lamps whose wattage is above the maximum values specified does not exceed 3; and
   ii) number of lamps whose lumen values are below minimum values does not exceed 3.

11.3 Life Performance

Life test and measurement of lumen maintenance shall be done on the samples chosen for LTQ. The life test shall be terminated at 125 percent of the rated life. A batch shall be considered to comply if:

a) *For Batch*

  i) The average life attains the value set out in Table 4.

NOTE — For LTQ of 5 lamps, the average life obtained, shall be subjected to 12·5 percent allowance. This figure is the statistical allowance to take into account the relatively small size of samples taken for the life test.

b) *For Individual Lamps*

  i) The number of lamp having life shorter than 50 percent of the rated life shall not exceed 1,

  ii) The number of lamps having life shorter than 75 percent of the rated life [including the failure under (i) above if any] shall not exceed 2, and

  iii) The number of lamp failing in lumen maintenance shall not exceed 1.

ANNEX A

(*Clause* 6.1)

STANDARD METHOD OF MEASURING THE PINCH TEMPERATURE OF QUARTZTUNGSTEN-HALOGEN LAMPS

A-1 PURPOSE OF THE TEST

A-1.1 This specifies details of the type of thermocouple to be used to measure the pinch temperature of quartz-tungsten-halogen lamps, the methods of preparation of the lamp and thermocouple, and the measurement to be made.

A-2 LAMP PREPARATION

A-2.0 The lamp shall be prepared by one of the methods specified in **A-2.1** and **A-2.2**. Whichever method is adopted, the T-formed edges of the pinch, if present shall be split to ensure a good thermal connection between the pinch and the thermocouple junction.

A-2.1 Method 1

An incision shall be made in the pinch so that the bottom of the incision coincides with the surface of the pin (*see* Fig. 1). The incision shall be cut using a diamond wheel having a maximum width of 0·5 mm and an outside diameter of about 100 mm. Because the wheel cuts a curved surface as shown by the line AB, the edges shall be flattened to give an incision as shown by the line AB. The corners shall be rounded to ensure that the thermocouple is in thermal contact with the pin. The incision shall be made abreast of the pin-to-foil weld at the side adjacent to the pin. The slope of the incision, *a*, shall be chosen so that the foil does not appear in the incision.

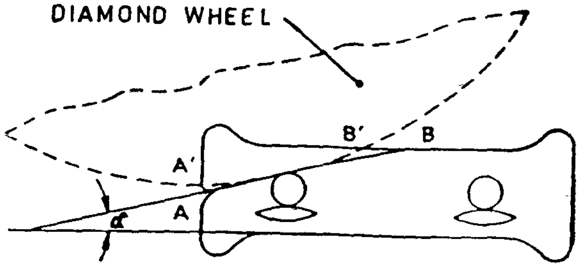
A-2.2 Method 2

A hole 1 mm in diameter shall be made in the pinch opposite to pin-to-foil weld (*see* Fig. 2) using an ultrasonic drill. The depth of the hole shall be such that the pin is exposed.

A-3 THERMOCOUPLES

A-3.1 Type of Thermocouples

The thermocouples recommended for the



MAKING OF THE INCISION

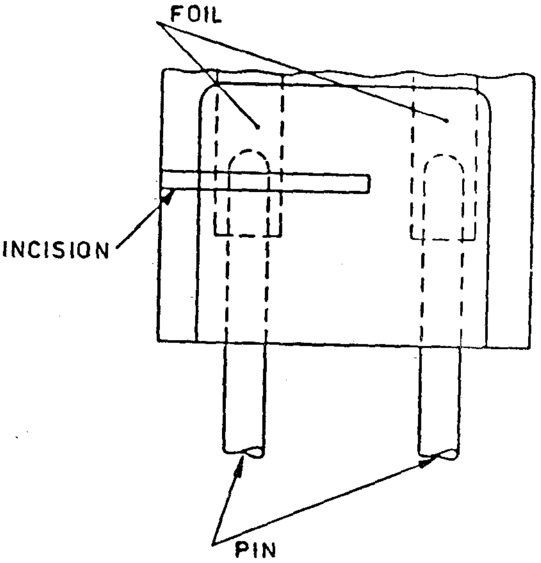


FIG. 1 LAMP PREPARATION DIAGRAM — METHOD 1

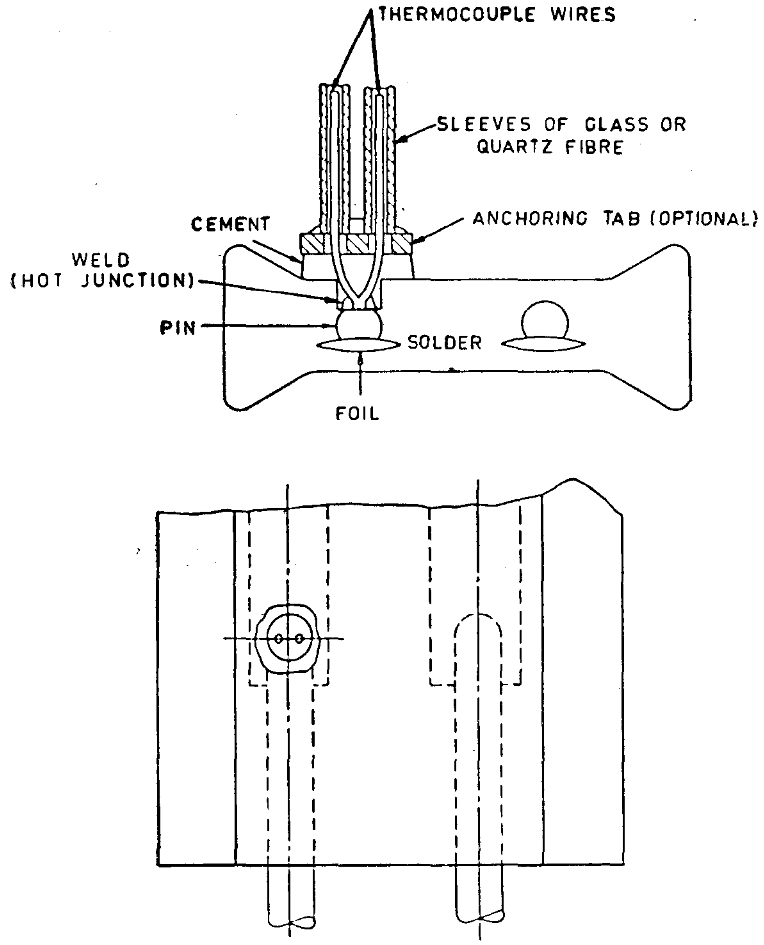


FIG. 2 LAMPS PREPARATION DIAGRAM — METHOD 2

temperature measurement are nickel/nickel-chromium, or iron/copper-nickel (Type J). Each wire forming the couple shall have a maximum diameter of 200μ m.

A-3.1.1 *Method 1*

The wires should meet at an angle of 150° and after the ends have been welded together, the wires are then brought into an approximate straight line with the weld projecting slightly to one side.

A-3.1.2 *Method 2*

The thermocouple junction shall be formed by laying the two wires parallel, welding them together with both wires extending in the same direction from the point at which the weld is made.

NOTE — The relationship between emf and temperature can be obtained from thermocouple reference tables for iron/copper-nickel (Type J) thermocouples.

A-3.2 Fixing of Thermocouples

The thermocouple shall be fixed using the method specified in **A-3.2.1** or **A-3.2.2.** In order to achieve good thermal contact between the thermocouple junction and the pin, it is preferable to solder or weld the junction to the pin. If this is not possible, the thermocouple junction may be cemented to the pin. When cement is used, electrical contact between the thermocouple junction and the pin is taken to indicate sufficient thermal contact between them.

Figures 3, 4, 5, 6 and 7 illustrate the details of examples of using Methods 1 and 2 for attaching the thermocouples to lamps fitted with various types of caps.

A-3.2.1 *For Method 1*

For lamps that have been prepared according to Method 1 (**A-2.1**), the thermocouple shall be pulled over the pinch, in the incision, so that junction is in thermal contact with the pin and the junction soldered or welded to the pin. The entire incision shall then be plugged with cement (*see* **A-3.2.3**). The use of an anchoring tab for leading the wires from the pinch is recommended (*see* **A-3.2.4**).

A-3.2.2 *For Method 2*

For lamps that have been prepared according to Method 2 (of **A-2.2**), the thermocouple junction shall be placed in the hold so that the

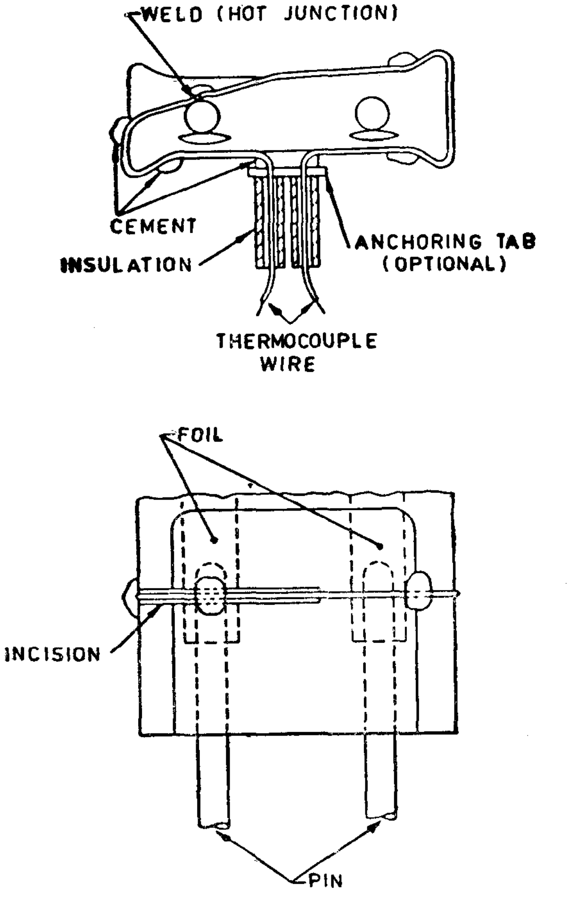


FIG. 3 ATTACHMENT OF THE THERMOCOUPLE ON LAMPS WITH BASES G6·35, GX6·35 OR GY6·35 — METHOD 1

junction is in contact with the pin and each wire would once round the pinch. The junction is then soldered or welded to the pin and the hold filled with cement (*see* **A-3.2.3**). The use of an anchoring tab for leading the wires from the pinch is recommended.

A-3.2.3 The cement shall be either a basing cement for halogen lamps, or a mixture of one part of sodium silicate and two parts of talcum powder.

A-3.2.4 An anchoring tab may conveniently be made using twin-capillary ceramic tube manufactured for use with thermocouples.

A-4 TEMPERATURE MEASUREMENT

A-4.0 The emf produced by the thermocouple shall be measured by a millivoltmeter having an input resistance about 100 times the resistance of the thermocouple or by another suitable measuring device.

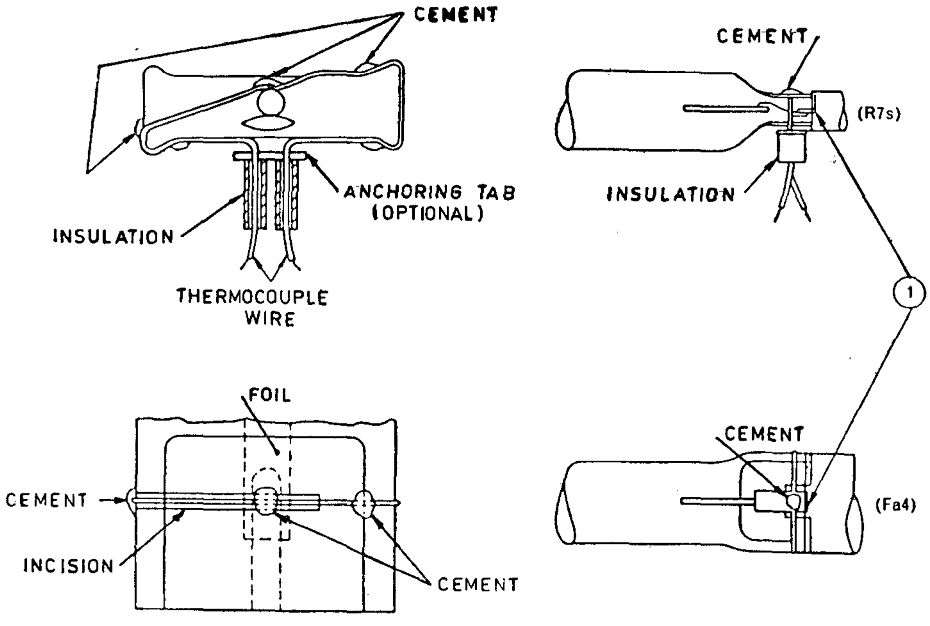
A-4.1 Thermal equilibrium shall be attained before a measurement is taken.

NOTE — This state should be achieved within 0·5 to 1 hour.

A-5 RESULT

A-5.0 The temperature measured using one of the above methods increased by the ambient temperature shall be recorded as the pinch temperature of the lamp.

NOTE — Ambient temperature is understood to be cold junction temperature.



NOTE — If the pin to foil weld is covered by the lug of the cap, the lug can be removed with the aid of a diamond wheel as far as necessary.

FIG. 4 ATTACHMENT OF THE THERMOCOUPLE ON LAMPS WITH CAPS R7s OR Fa4 — METHOD 1

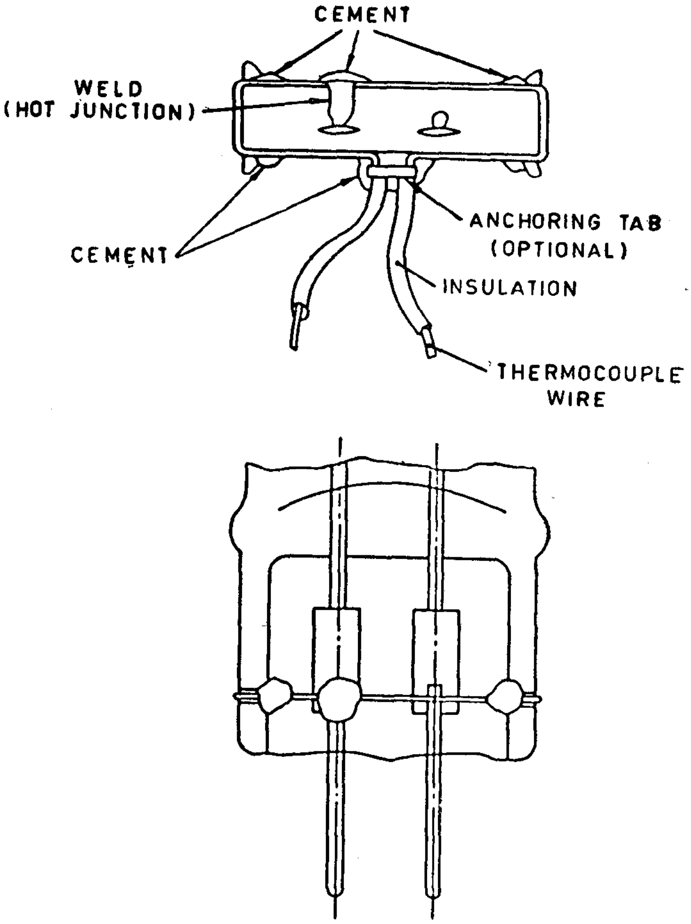
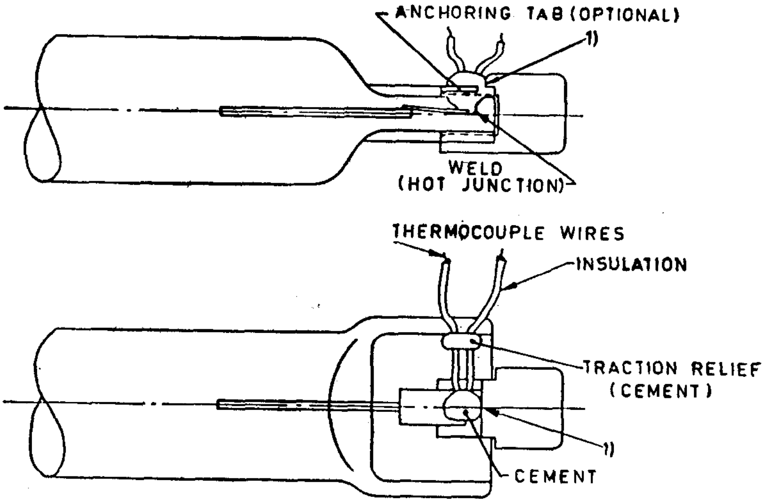
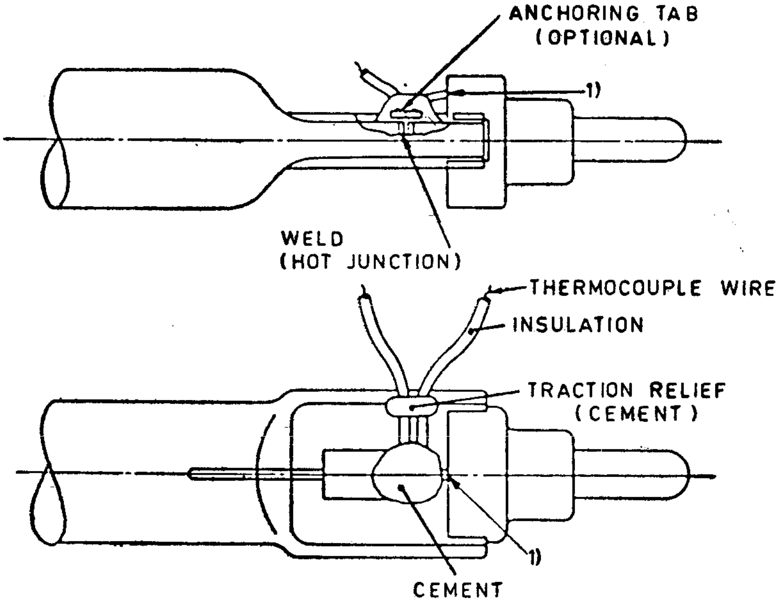


FIG. 5 ATTACHMENT OF THE THERMOCOUPLE ON LAMPS WITH BASES G6·35, GX6·35 OR GY6·35 — METHOD 2



NOTE — If the pin to foil weld is covered by the lug of the cap, the lug can be removed with the aid of a diamond wheel as far as necessary.

FIG. 6 ATTACHMENT OF THERMOCOUPLE ON LAMPS WITH CAP R7s — METHOD 2



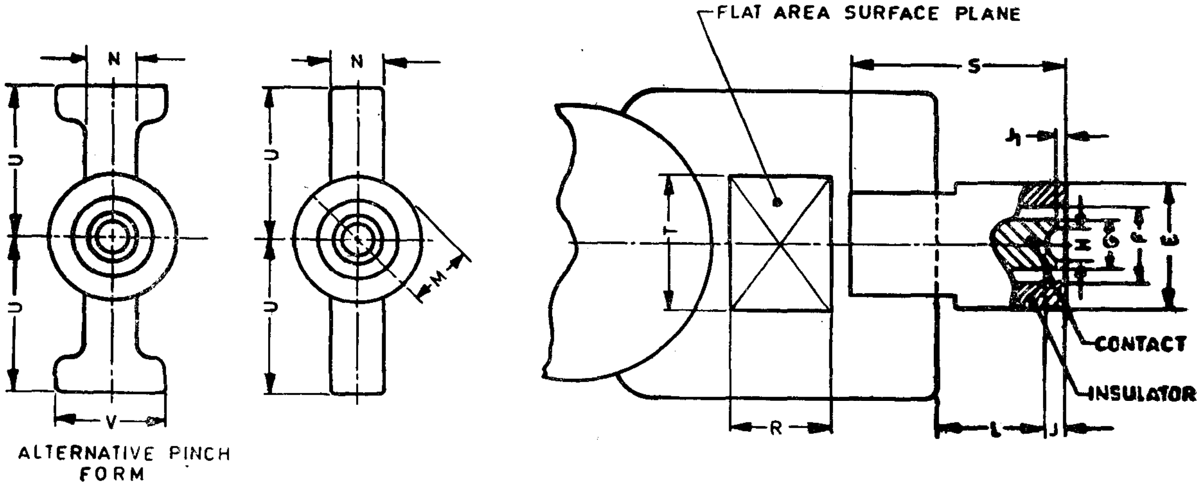
NOTE — If the pin to foil weld is covered by the lug of the cap, the lug can be removed with the aid of a diamond wheel as far as necessary.

FIG. 7 ATTACHMENT OF THE THERMOCOUPLE ON LAMPS WITH CAP Fa4 — METHOD 2

ANNEX B

(*Clause* 7.3)

RECESSED SINGLE CONTACT CAP AND END OF LAMP



Scale 2:1

	Standard Dimensions			Nearest Equivalent in Inches	
	Dimension	*Min*	*Max*	*Min*	*Max*
	E	—	7·49	—	0·295
	F	4·19	4·45	0·165	0·175
	*G**	2·8	—	0·110	—
	*H**	1·8	2·8	0·070	0·110
	J	—	2·03	—	0·080
	J_1	0·5	—	0·020	—
	L	2·9	—	0·114	—
	M[4]	—	4·19	—	0·165
	N[2]	2·0	3·8	0·079	0·150
	R[1]	5·0	—	0·197	—
	S[1]	—	12·5	—	0·492
	T[1]	5·5	—	0·217	—
R7s-15	*U*	—	7·4	—	0·290
R7s-15	*V*[3]	—	5·5	—	0·217
R7s-18	*U*	—	9·0	—	0·354
R7s-18	*V*	—	8·0	—	0·315
R7s-21	*U*	—	10·65	—	0·420
R7s-21	*V*	—	8·0	—	0·315

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*These dimensions are solely for cap design and are not to be gauged on finished lamp.

1) This dimension is applicable only when a heat sink is required.

2) This dimension refers only to the area defined by dimensions *T* and *R*.

3) The combination of the two values of this dimension in a complete lamp is checked by an alignment gauge having two opposite parallel slots each 5·72 mm (0·225 in) wide.

4) This dimension denotes the distance from the centre of the contact to any point on the circumference of the ceramic sleeve.

NOTE — Special attention shall be given to the choice of contact material (for example, silver gives good results).

ANNEX C

(*Clause* 8.1)

SUGGESTED METHOD OF SELECTION

C-1 BATCHES

C-1.1 Batches Consisting of 1 000 or Less Lamps

For batches consisting of less containers, lamps shall be selected from every container. For batches consisting of more than ten containers, lamps shall be selected from at least one-half of the total number of containers in the batch, with a minimum of ten containers.

C-1.2 Batches Consisting of More Than 1 000 Lamps

As nearly as possible form one-third of the total number of containers in the batch, with a minimum of ten containers.

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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